

ANNUAL No. 5

MAY 1959

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# CANADIAN GEOGRAPHICAL JOURNAL

UNIVERSITY  
OF MICHIGAN

MAY 12, 1959

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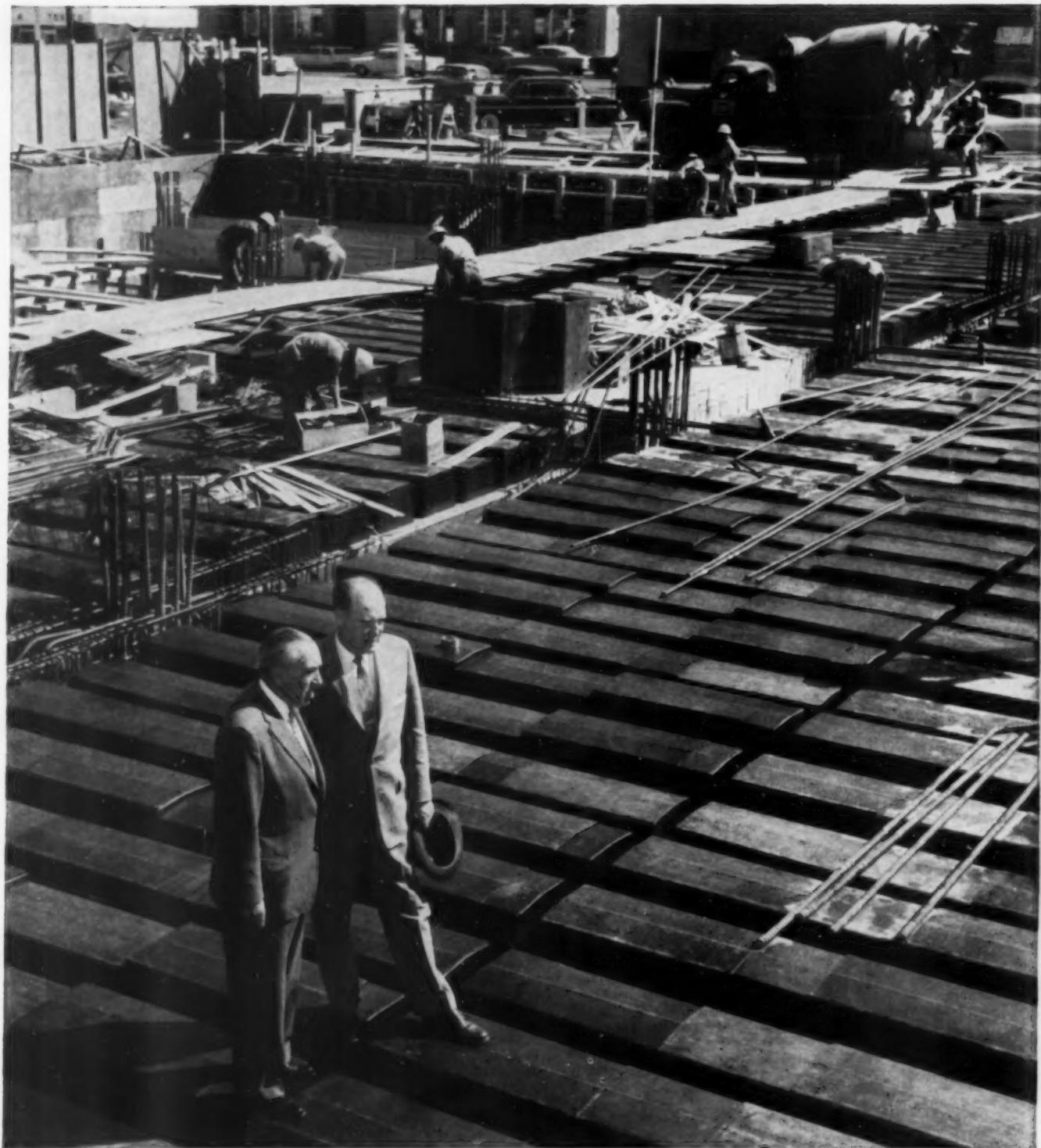
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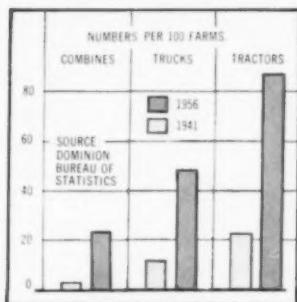
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Published monthly by

THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY

Ottawa, Ontario

Editor - GORDON M. DALLYN

This magazine is dedicated to the presentation in authentic and popular form, with extensive illustrations, of the broad pattern of Canadian life and its industrial, physical, and cultural foundations.

The articles in this Journal are indexed in the *International Index to Periodicals* and in the *Canadian Index*.

The British standard of spelling is adopted substantially as used by the Government of Canada and taught in most Canadian schools, the precise authority being the Concise Oxford Dictionary, fourth edition, 1951.

Address all communications regarding change of address, non-delivery of journal, etc., to the publication office, 1000 St. Antoine St., Montreal 3, Canada, giving old and new address. On all memberships the expiry date will be printed on wrapper. This will constitute a receipt for subscription.

Membership dues of The Royal Canadian Geographical Society, which include postpaid delivery of the journal, are \$5.00 per year in any country, payable at par in Ottawa. All remittances should be sent to Head Office.

Member Audit Bureau of Circulations

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(Tel. CE. 6-7493)

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MAY 1959 • VOLUME LVIII • NUMBER 5

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PRINTED IN CANADA



*"Water over the dam" of the Gatineau Power Company hydro development at Grand Falls, N.B., during the spring freshet. Further developments planned for the future will greatly reduce the annual run-off.*

# **Power in New Brunswick**

by W. A. DIXON

**I**t is a little over a year now since the dam at Beechwood, New Brunswick, put a final brake on the freedom of the St. John River at that point and channelled its course through the huge turbines in the power house of the plant that would bear the name of Beechwood, a former whistle stop on the Canadian Pacific Railway 100 miles north of Fredericton.

There will be no one to dispute that the completion of the project was an achievement of the first order. For the Province of New Brunswick, with a population of less than half that of the city of Montreal, the decision to go ahead with the development in the first place was courageous to say the least, for, in terms of money, it meant an outlay that was not far short of the Provincial Government's entire annual income. But New Brunswick needed power urgently if it was to go ahead and take its rightful place in the industrial life of Canada.

For generations past the Province has relied upon nature to supply most of its primary needs. Fishing, farming and forestry formed the basic strength from which its present economy has sprung.

With over 600 miles of coastline the Province has since its early history maintained a natural affinity to the sea. Each year over 10,000 fishermen bring ashore an average of 225 million pounds of fish with a market value of about \$22 million. While agriculture has steadily progressed through the years, New Brunswick's woodland industry has remained its chief source of economic strength. This fact is in no way surprising since almost eighty per cent of the Province's 28,000 square miles is forested. From this natural heritage New Brunswick receives over \$150 million annually. Notwithstanding the huge yearly harvest, the volume of growing stock is steadily increasing under an improved method of forest management and fire protection. Indeed, it has been reliably estimated that the potential yield is approximately three times the quantity now being utilized. It would appear almost certain that

New Brunswick holds sure promise of a greatly expanded use of its immense woodland resources.

To preserve the forests from the ravages of insects, such as the spruce budworm, is a costly business for both government and private enterprise. During the past seven summers a fleet of planes has flown over thousands of acres of forest lands spraying millions of gallons of D.D.T. in order to save the trees for future harvesting.

Although, in the past, the economy of the Province remained closely associated with the land and the sea, many new and potentially rich industries are contributing to a new industrial growth to a point where New Brunswick is rapidly becoming Canada's newest industrial province. No doubt the most promising of these new developments are in the embryonic stage and have their roots in the processing of base metals from the mineral discoveries of a few years back. Other industries, ranging from furniture to fast-freezing, and from textiles to oil refining are playing their part in building a solid industrial economy for the Province.

But New Brunswick knows full well that if this growth is to continue and expand it must have power: power in sufficient quantities and at a cost where industry will find it economically feasible to process the abundant natural resources within the borders of the Province.

Charged with the responsibility of making this power available is The New Brunswick Electric Power Commission, the province-owned electric utility that came into being by an Act of the Legislature in 1921. The meaning of the Act was patterned to a large extent after that of Ontario Hydro, which preceded that of New Brunswick by fifteen years.

Starting in a very small way, the newly formed Commission built a hydro plant on the Musquash River; a rather modest stream of only 140 square miles drainage area, that empties into the Bay of Fundy about fifteen miles east of the city of Saint John. As was the

PROVINCE OF QUEBEC



case in most provinces at that time, rural electrification was no problem; in fact it was not even considered. Getting electric power to the urban areas for commercial and domestic use was the first consideration. From then on the growth was steady. But the annual increments were on a comparatively small scale and as a result the cost per kilowatt hour was high in relation to the central provinces with their abundance of low-cost hydro potential.

One might say the current upward economic

trend in New Brunswick got its start shortly after the Second World War. At the beginning of hostilities in 1939 the Province was in the unfortunate position of having very little, if any, surplus power. During the war years emphasis was on the conservation of consumer goods and the materials and facilities necessary for the construction of new generation had been diverted almost wholly to the war effort. It naturally followed that large Crown corporations and private industries, anxious to get into

immediate war-time production, would locate in areas with sufficient economic power to supply their urgent requirements. This fact, more than anything else, furnished New Brunswick with ample evidence that industry followed power; that if the Province was to keep pace with the general growth of Canada as a whole it must be assured of future supplies of power that would stimulate and sustain industrial development.

This was the situation that faced the Province in 1944, and to meet it a Resources Development Board was established by Order in Council of the Provincial Government. Appointed to head this group was Dr. H. J. Rowley\*. Although the Board's assignments covered a wide range of studies, two emerged as being the most important to the economy of the Province. Airborne magnetometer surveys, secured by the Resources Development Board from Ottawa, revealed large ore bodies that were later proved to contain sizable deposits of lead, zinc, copper and silver. It was also disclosed that the difficulty in the Province was of a deep-seated nature and could not be cared for by surface application only. It was realized that power in greater supply and at a lower cost was definitely necessary if New Brunswick was to improve its industrial position.

Surveys of a number of likely streams were soon under way which later exposed large blocks of latent hydro energy. The very idea that New Brunswick's power problem could be partly solved by hydro-electric developments did not, to say the least, receive unanimous acceptance. There were those who maintained that the only hope for this essential power must be wholly based on small, dispersed, thermal plants burning coal from the local fields. However, this segment of opinion soon conceded that the most practical overall solution to the problem was an integrated system of both thermal and hydro generation. The thermal plants would carry the base load during periods of low river flow, with hydro providing for the

\*A native of New Brunswick, Dr. Rowley received his university training at Mount Allison, in Arts, and at Queen's, in Chemical and Metallurgical Engineering. Following several years of post-graduate studies at Massachusetts Institute of Technology, he attended McGill, where he received his Ph.D. During the Second World War he was Director of Operations, Allied War Supplies Corporation, in the production of chemicals and explosives.

*Getting the logs from the forests to the mills presents some problems for these woodsmen on their annual spring drive.*



*Some of the best lobster fishing grounds in the world are in the shallow bays on the eastern coast of New Brunswick.*



*Potatoes are New Brunswick's principal cash crop. This scene is typical of many others in the upper St. John River valley where stock for table and seed purposes is grown for local and foreign markets.*



daily peaks. Possibly the real advantage of this system is that it functions equally well in reverse. During periods of high river flow that normally occur in the spring, early summer, and fall, hydro generation takes over the base load, with steam or thermal power reserved for peaking purposes.

The first hydro plant to tie in with this approved plan of production for the Province was a 20,000 kilowatt station on the Tobique River. This relatively small but efficient plant began producing power in the spring of 1953. It was while this project was in the course of construction that it was realized, if New Brunswick was to gain the industrial position it so eagerly sought, it must have larger single blocks of hydro power than could possibly be developed from the smaller streams of the Province.

The only river that could conceivably furnish this kind of power was the St. John. But the St. John is a flashy river with wide variations in flow and there were many at that time who had grave doubts as to whether economic power could be produced on a run-of-the-river basis. Certain facts were already known. The river drains an area of 21,000 square miles in New Brunswick, Quebec, and the State of Maine, and is one of the larger rivers of the North American continent. The total fall from its source at Little Lake St. John in Quebec to tide-water at Fredericton is about 1,580 feet. Of this drop, only 125 feet had been developed for power at Grand Falls at that time.

Equipped with other information obtained from earlier surveys, field crews of the Resources Development Board concentrated on the St. John River. As at that time no approach had been made to the State of Maine, the Province of Quebec or the International Joint Commission, the preliminary investigations were necessarily confined to that section of the river-basin within the Province of New Brunswick. Some crews made soundings and other observations at a number of likely sites on the St. John River between Grand Falls and Fredericton while others turned their attention to the Tobique River and its head-water lakes lying deep in the hilly forests of central New Brunswick. These preliminary investigations

continued unabated for well over three years. During the winter months when the lakes and streams were frozen, drilling operations were carried on through the heavy ice.

By the spring of 1949 the Board had accumulated a volume of important information and the prospects for the much-needed hydroelectric power looked very encouraging. A report presented later to the Provincial Government drew attention to a number of sites in the Canadian section of the St. John River that appeared to have very definite hydro potential. But to arrive at the final solution of all the problems involved New Brunswick could not proceed alone. In addition to power development, there were other aspects to consider, such as storage, lumber driving, flood control, fish migration, pollution. Then, too, the St. John was not only an interprovincial river but an international river as well. These were some of the problems that would eventually have to be solved to the satisfaction of all concerned.

The solution of this field of inquiry was beyond the scope and jurisdiction of a provincial government. It was therefore decided to place the whole subject in connection with the study of the river in the hands of the Federal Government with the suggestion and hope (subsequently fulfilled) that it be assigned to the International Joint Commission.

This quasi-judicial body comprised of three members from each side of the international border has, over the years, earned an enviable reputation for resolving the differences relating to international water along the 3,000 miles of friendly border.

The International Joint Commission entered wholeheartedly into an exhaustive study. An Engineering Board was named and other technical groups set up to examine all aspects of the entire watershed. The interim report delivered three years later to the governments of Canada and the United States substantiated the findings of the Provincial Resources Development Board: economical power in substantial blocks could be produced at a number of sites on the St. John River.

The location that held the greatest promise for immediate development, on a run-of-



*The St. John River drains an area of 21,000 square miles in New Brunswick, Quebec and the State of Maine. This panoramic view shows the rich farmlands in the upper river valley.*

the-river basis, was Beechwood. This site was just below the confluence of the Tobique and Aroostook Rivers, so naturally it would benefit from the present and any future storage that could be developed in these two tributaries. In addition, it would fit nicely into the generally accepted plan of a hydro and thermal integrated system.

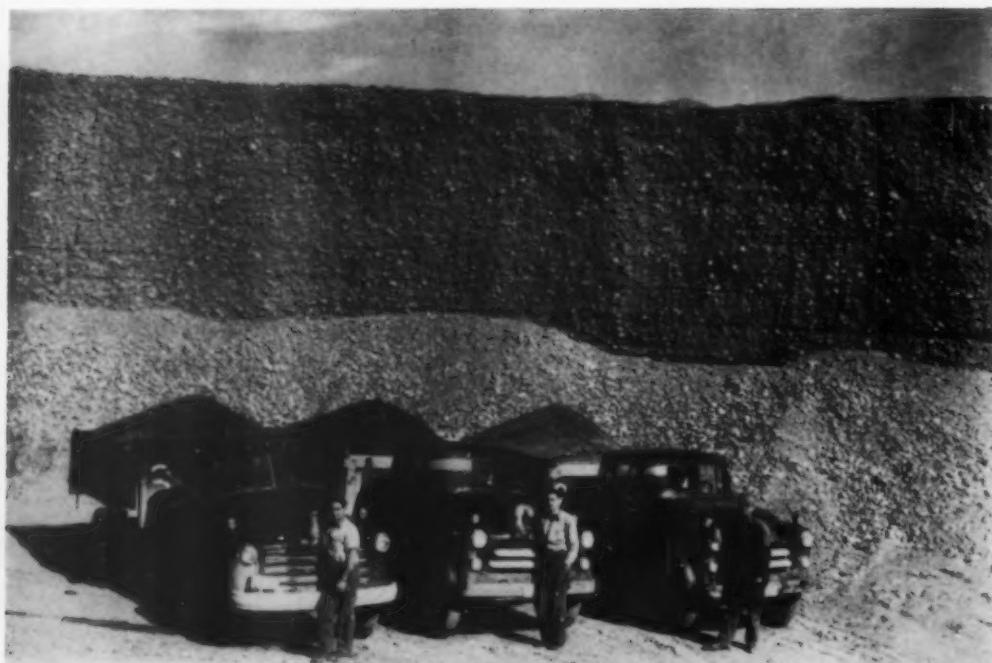
New Brunswick's dilemma was obvious. Here was a development that could start the Province on the road to economic self-sufficiency, but the estimated cost of the project was \$30 million. At that time, 1953, Canada's fiscal policy was not geared for this abnormal provincial capital expenditure. Money was tight and New Brunswick's credit was strained.



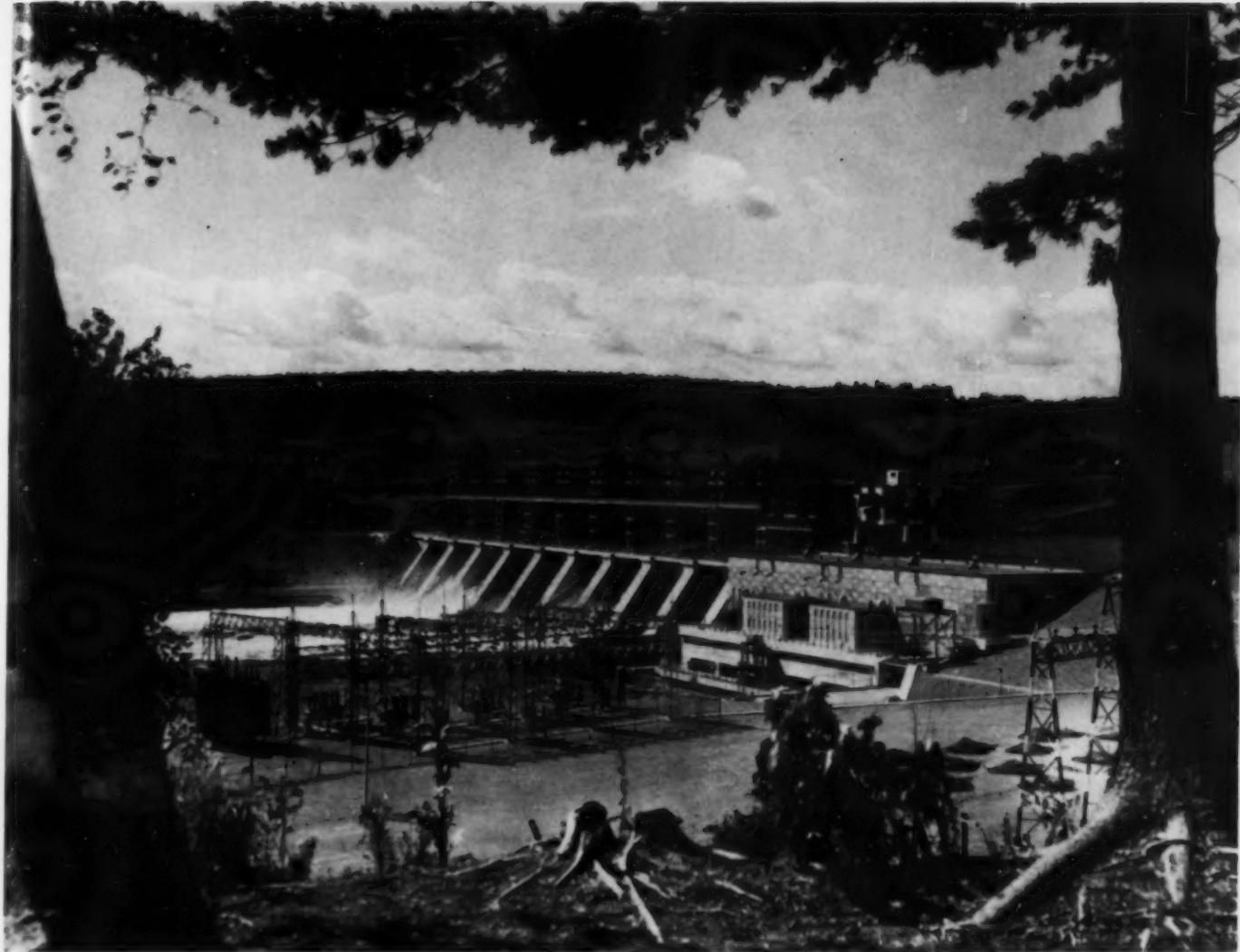
*In preparation for the flooding of the head pond a number of highway and railroad diversions were necessary. Crews of men are at work here blasting through solid rock in order to raise a section of the Trans-Canada Highway.*



*The village of Perth, N.B., on the St. John River, 15 miles north of the Beechwood hydro development. Prior to the flooding of the head pond, 68 dwellings and commercial establishments had been demolished or relocated. The river bank in the foreground, where the old buildings previously stood, is now a parking area.*



*This huge seam of gravel discovered a few miles from the site of the hydro development at Beechwood, N.B., supplied the entire gravel requirements for the project.*



*The Beechwood hydro development on the St. John River. The \$30,000,000 project began producing power for the Province in November 1957.*

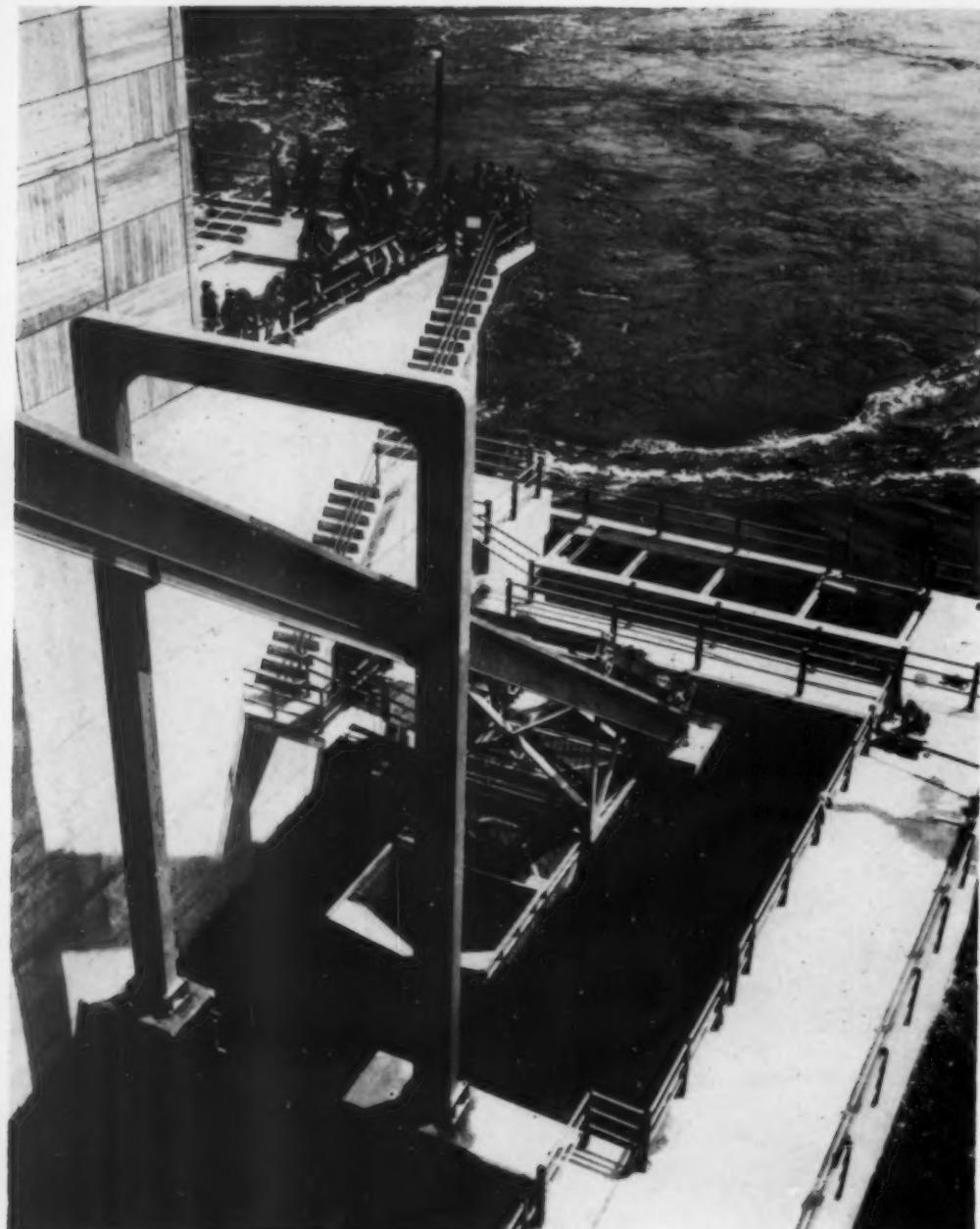
It certainly was not the appropriate time to negotiate a long-term provincial loan for a project of this type and size. Interest rates have a very direct bearing on the cost of power, and in particular, hydro power, where fixed charges represent about eighty per cent of the operating cost.

Knowing that it would take almost three years to complete the project, there was no time to lose. An early start was imperative. Normal load growth trends indicated beyond doubt that the energy from Beechwood would be required in the system by the fall and early winter of 1957.

The next step was to complete an arrangement with the chartered banks to finance temporarily the development during the construc-

tion stages, it being understood that a long-term loan would be negotiated at a later date and under more favourable fiscal conditions. Whatever hazards that may have appeared at the time regarding this method of financing vanished on 8 October 1957, when Her Majesty Queen Elizabeth, in the Speech from the Throne opening the Canadian Parliament, announced her Government's intention of assisting in the financing of the Beechwood project in New Brunswick.

Going back to the early months of 1954, we might say The New Brunswick Electric Power Commission was concerned mainly with three significant objectives as part of its plan for the future development of power. The first and most urgent was the Beechwood hydro de-



*A group of visiting Boy Scouts from the Provincial Jamboree show a keen interest in the operation of the fish elevator at the Beechwood hydro plant.*

velopment. The next was a plan for the integration of all generating systems in the Atlantic area. The third, but not the least in importance, was the construction of a 138,000 volt transmission system that would connect the existing and future generating stations with the load centres of the Province. There were many others, naturally, but in the broad perspective these seemed to predominate.

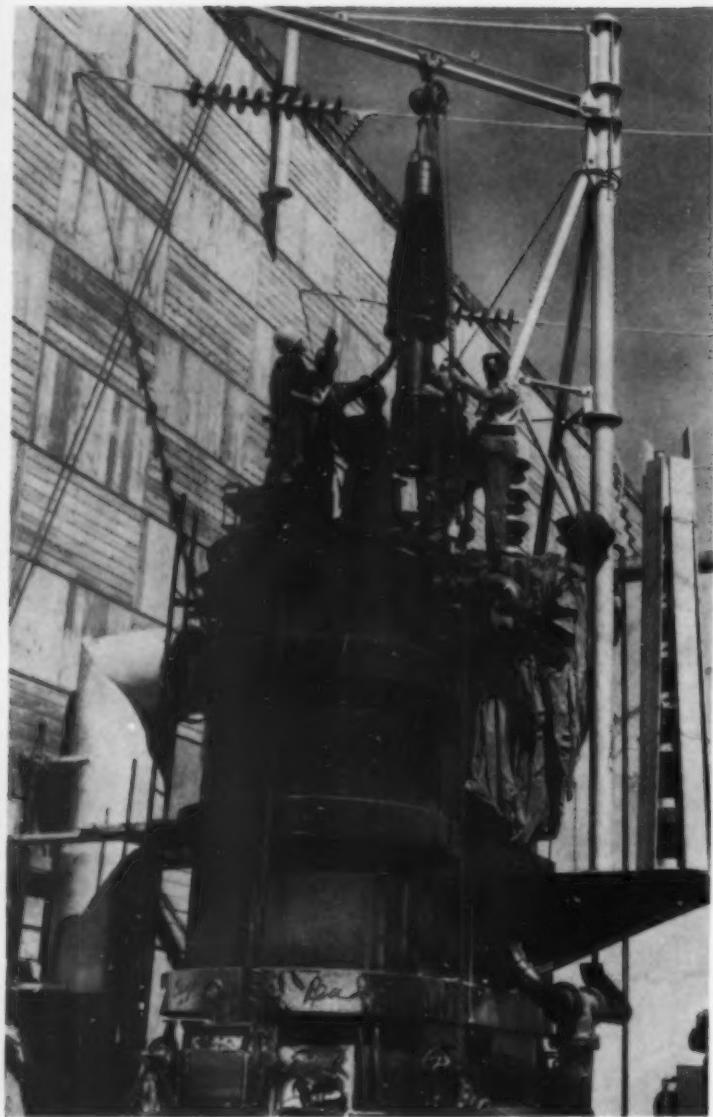
During the early summer of 1955 all sorts of construction machinery arrived daily at the Beechwood site. Hundreds of men were engaged in a variety of jobs, from the building of

camps to house and feed a thousand men, to the construction of coffer-dams to divert the flow of the river. With the insulation of the concrete plant and conveyor system, work continued all through the following winter, although at times the temperature at the site dipped to 30° below zero. By spring, the completed piers in two-thirds of the river's channel received their first test as they withstood the full force of the early freshet.

The only coffer-dam remaining at that time enclosed the section from which the power house was to rise. In there, the big buckets



*Sluice gates weighing 85 tons and built to withstand a pressure of 14 pounds to the square inch can be raised or lowered by the mechanism at the Beechwood dam.*



*Workmen erecting the insulators on a step-up unit transformer on the deck of the power house at Beechwood.*

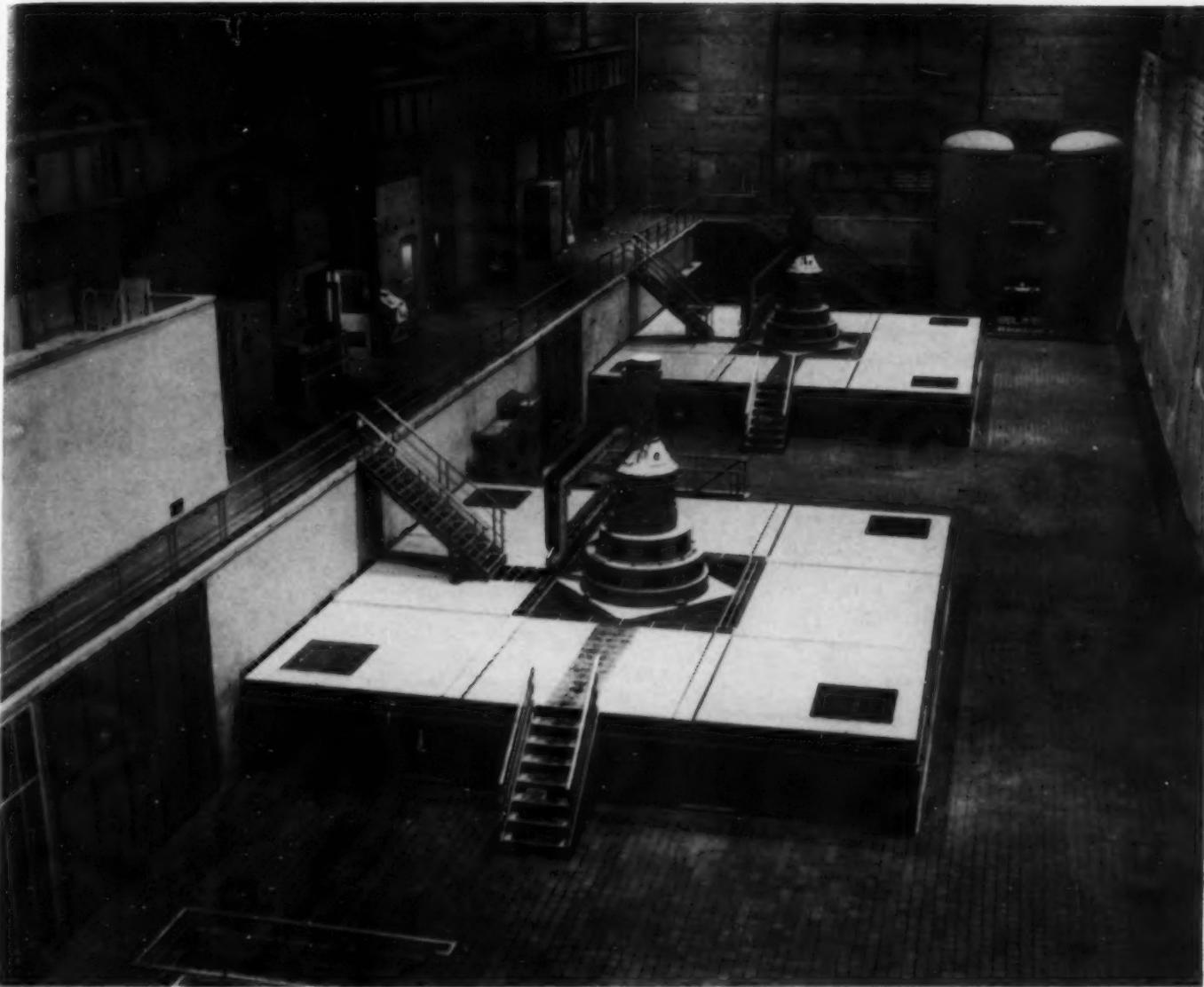
went to work loading truck after truck, day after day, until all the gravel, rock and overburden had been removed. Even then, great care had to be taken to make sure that any crevices in the rock were sealed watertight to ensure a perfect bonding.

Another important matter that received careful attention of the designers and builders was how the damming of the river was going to affect the Atlantic salmon on their journey from the sea to the spawning grounds in the upper reaches of the river-basin. At the Tobique dam, about seventeen miles up-stream, a fish-pass connected with four resting pools was built, enabling the salmon to find their way up and around the eighty-foot obstruction. At Beechwood they receive very special attention; attracting water guides them into an elevator where they are cared for by a specially trained staff under the supervision of a fish biologist. When they arrive at the head pond the salmon are counted, spot-tagged for later identification and all predators, such as the lamprey eel, are removed from the fish basket and destroyed.

The Beechwood project grew in size and shape until all was in readiness for the pressure of a switch that would send the power it had created into the homes and industries of the Province.

*The recently enlarged mill of the Irving Pulp and Paper Company Limited located in Lancaster, across the river from Saint John, at the site of the famous Reversing Falls. This pulp-and-paper mill is one of 5 provincial mills interconnected with The New Brunswick Electric Power Commission's system.*





*Two generating units, each with a capacity of 45,000 h.p., are installed at the Beechwood hydro-electric development. Provision is made in the power house for the future installation of a third unit of similar size.*

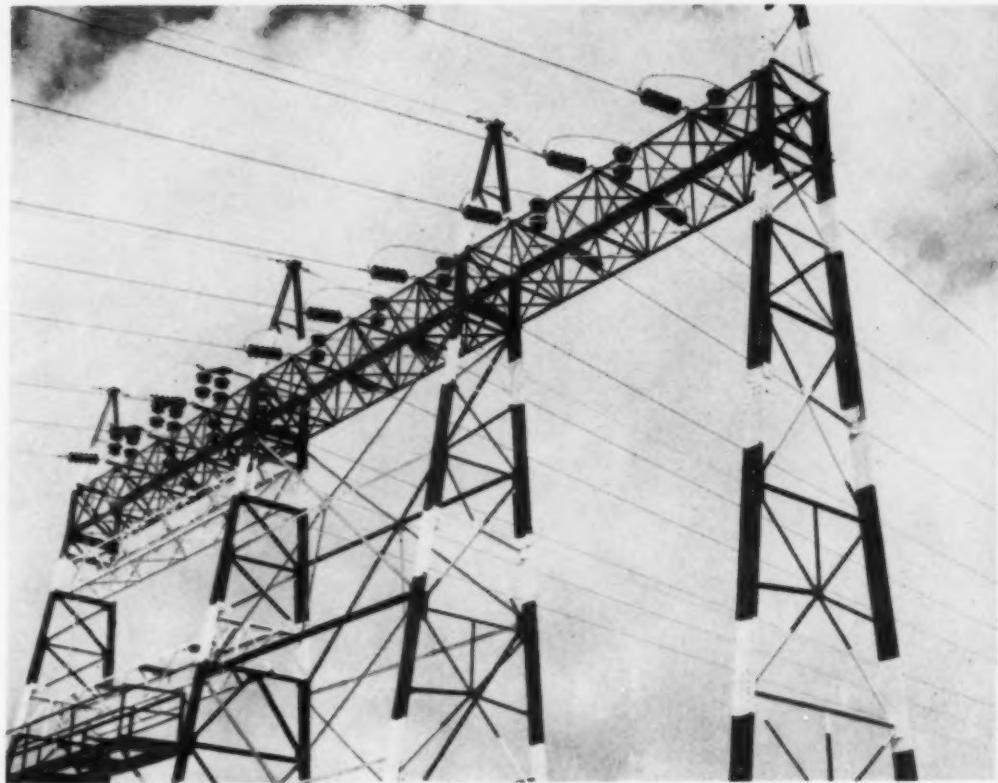
*An air view of the Maritime Cement Company Limited plant at Havelock. The industry began operations in 1950. Prior to that time the Company's products were shipped into the Atlantic area from outside points.*





A vertical view of the 250-foot stack at the Chatham thermal plant of The New Brunswick Electric Power Commission. One reason for its extreme height is to reduce the concentration of both gases and solids that escape from the plant.

*Take-off towers of the new 138,000 volt transmission system put their mark of the twentieth century over the fields and forests of New Brunswick.*



As part of the overall plan, the construction of the new 138,000 volt transmission grid that would soon carry the energy to places where it was needed began to reach out over the fields and forests of the Province. In some areas the new line was built parallel to the existing 69,000 volt grid that, up to then, had been the only high voltage link between the source of power and its user.

While all this was taking place the plan for the interconnection of the generating systems in the area was keeping pace with the general expansion program. One by one the five major pulp-and-paper companies operating in the Province became partners in the reciprocal arrangement. This step was soon followed by a

tie-in with the Maine Public Service Company, a private utility distributing power in the northern section of the State. By March next year the systems in the Province of Nova Scotia will be added to the area power pool. This bringing together of the energy resources of the area has already left its mark on the industrial life of the Province. Pulp-and-paper companies formerly hampered by seasonal power deficiencies have been able to step up production by the use of surplus or off-peak power from the integrated system.

In addition to making use of this former potential energy, the plan has many other advantages to offer. Its permits the reduction in stand-by capacities of the individual systems and allows the use of larger and more efficient units for future production. It is, in effect, a mutual assistance program between the eastern Canadian provinces and the State of Maine that could eventually result in a unity of purpose in other realms of co-operative endeavour.

With eight plants transmitting their energy over a province-wide grid and a new 50,000 kilowatt thermal station under construction in the port city of Saint John, New Brunswick is, for the first time in history, well out in front of a rapidly climbing load curve.

*Head office of The New Brunswick Electric Power Commission at Fredericton. The building was first occupied by the Commission's administrative staff in October 1949.*





*Grey-white limestone walls pattern this hillside in Upper Wharfedale, England.*

## All For A Shilling A Day

by HARRY HAIGH

Photographs by author

THE FIELDS of England, minute by comparison with the unbroken expanses of Canada's agricultural acres, always delight the tourist visiting Britain for the first time. In the north country the dry stone walls patterning the landscape into a living jig-saw puzzle are an added source of wonder. But few visitors realize that most of them have been standing for well over a century, and were the work of an old breed of craftsmen who, using no mortar, built from unhewn stones these lasting tributes to their skill and cunning.

In about a century and a half, from the passing of the first Enclosure Act in 1709, it has been estimated that one acre in seven in England was enclosed. For carving up the land, stone walls were the obvious choice in those northern parts where stone was abundant — sandstone in some areas and limestone in others. And labour was cheap and plentiful. Tradition has it that the original dry-wallers of the beautiful limestone dale of Wharfedale

built one rood (seven yards) of wall a day to earn a shilling.

A handful of skilled dry-wallers keep the craft alive in the Yorkshire dales. Among them is Ronald Eggleston, who farms in Wharfedale under the shadow of Beamsley Beacon. He is the present champion of the dale, a title he earned in open competition. The test required him to "rid" (break down) and rebuild three yards of dry wall thirty-three inches wide at the base and five feet high. At two-foot and four-foot levels he built in heavy "through" stones a yard apart. The only tool allowed was a pick with which to break down the wall.

In the quiet of his isolated farm, Ronald told me something of his craft. "Each stone", he said, "has a 'bed' and a 'face' if you can feel it. Each stone must mate with its neighbour, and every joint must be covered by the stone above."

In essence, a dry wall is two walls with a cavity between. The cavity is packed with

#### ALL FOR A SHILLING A DAY

small stones to give the structure solidity. To tie the two faces together, heavy "through" stones are laid crosswise to project through both faces. From the foundation upwards each course is laid fractionally narrower than the one below. Stout top-stones crown the wall which, if properly built, will settle a little when finished, locking itself together. The result is a wall that looks as if it has grown where it stands, a wall that for generations will sturdily repel the onslaughts of gale, rain or frost, and give comforting shelter to stock.

What of the future? The labour cost of dry-walling, even when a man can be found to do it, has risen from the shilling a rood of the early craftsmen to about £3 and 10 shillings. For this reason Ronald Eggleston thinks few new walls of any length will be built, unless (and here speaks the countryman) "a man is farming for his sons, in which case walls in the long run are cheaper than fences or hedges". But Eggleston believes a good deal will be done

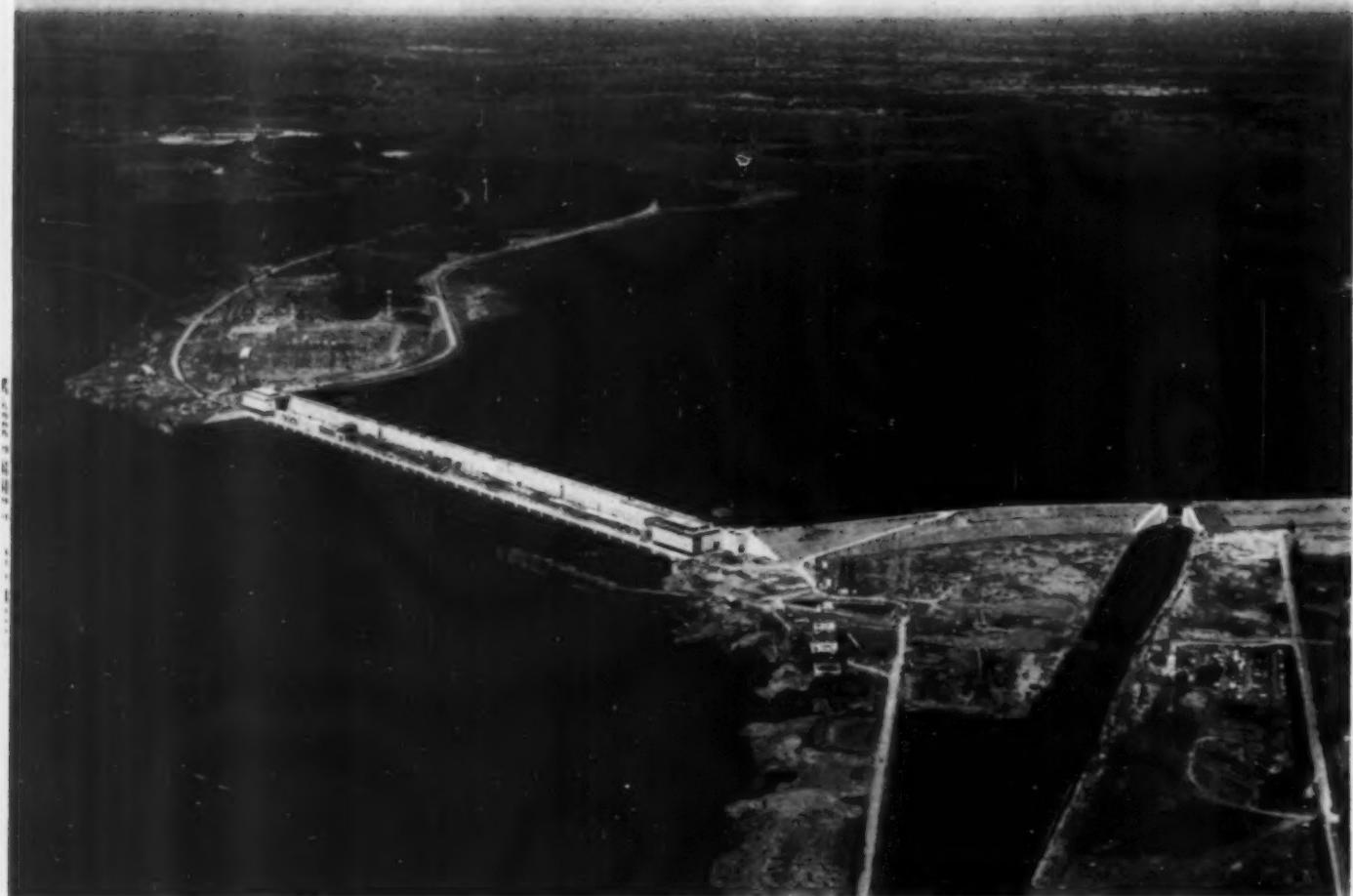
to maintain and preserve the existing walls by young farmers who, in encouraging numbers, are taking an interest in the old craft.

Eggleston is doing his share by passing on his knowledge to his young sons. David, the elder, has already a cup and medal won at the age of twelve in competition with other juvenile wallers. I asked the champion if he enjoyed walling. He smiled and nodded slowly, "A day's walling is as much a relaxation to me as a day's fishing is to some folk. What could be more peaceful than a day working on the moors with not a soul in sight and only the curlews crying? And at the end of the day there's the satisfaction that comes from a job well done".

There is a saying by Ruskin, "When we build, let us think that we build for ever . . ." It seems to me that it is in that spirit that Ronald Eggleston, champion dry-waller of Wharfedale, and his kind, have followed their craft through the ages.

*This end view of a wall two-thirds completed shows clearly the two faces, the massive "through" stones, and the important filling stones in the cavity between.*





Spanning the St. Lawrence River's north channel, the adjoining power houses of Ontario Hydro and the Power Authority of the State of New York are now producing power. When completed this fall, the St. Lawrence Power Project will have a total maximum capacity of 1,880,000 kilowatts in 32 generators — 16 each in the adjoining power houses.

## **Highway to the Inland Seas\***

by JAMES S. DUNCAN

IT FALLS to my lot from time to time to speak before a wide variety of organizations. Sometimes the choice of a suitable subject must be conditioned to the specific interests of the audience. In your case, I have no such difficulty. Geography, as I understand it, is a study of the earth's surface, of its climate, continents, countries, industries and products. That certainly gives me plenty of scope.

Since your Society was founded some

Illustrations from Ontario Hydro, except double-page map  
courtesy of The St. Lawrence Seaway Authority.

thirty years ago, geography has developed from a dry classroom subject into the modern and universal science which we know today. It is helping people everywhere to become better acquainted with the way other peoples live in distant lands, and accordingly, it makes them more conscious and more tolerant of the problems of their fellow men. Geography, in other words, is helping us all to become better citizens of the world.

\*This address was given by Mr. James S. Duncan at the thirtieth Annual General Meeting of the Society in the Lecture Hall of the National Museum of Canada, Ottawa, on 1<sup>st</sup> March 1959.

## HIGHWAY TO THE INLAND SEAS

"To make Canada better known to Canadians and to the rest of the world" is indeed an objective worthy of your great Society. Few things, it seems to me, are more important than to assist Canadians to a better knowledge of the vast potentialities of their own land. It is also important to afford people of other nationalities an opportunity of learning something of our Canadian way of life, which has led our 17,000,000 people to a position of recognized prominence among the 2,400 million people who occupy this earth.

Over the years I have followed the activities of your Society with interest, admiration and approval. The publication of the *Canadian Geographical Journal*, the lectures which you arrange, the documentary films which you sponsor, the scholarships which you provide — all these things are helping to build a better Canada and reflect great credit upon your honourable Society and upon your many dedicated workers, whose only reward lies in the knowledge that they are doing something worth-while for their fellow men.

One of Canada's most distinguished sons,

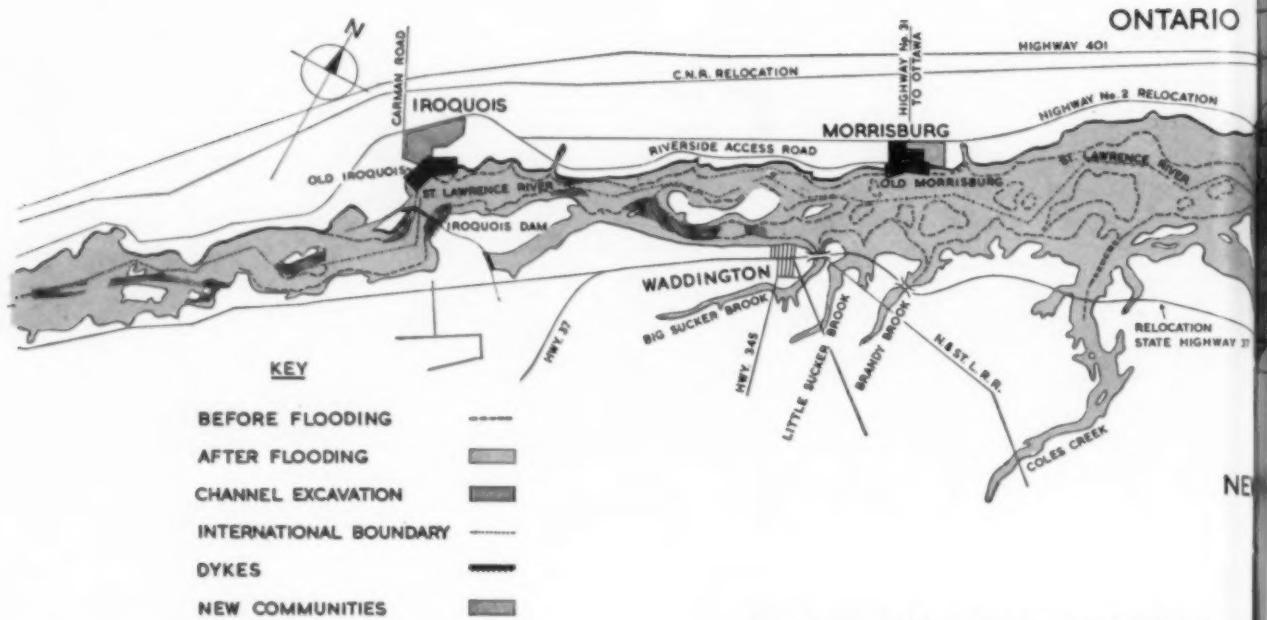
Dr. Charles Camsell, was your first president. He is no longer with us, but the flame of his indomitable spirit will burn brightly among you and those wider circles of men who appreciate the value of his work and recognize that he did more perhaps than any other Canadian to awaken our interest in the vast potential of our mineral resources.

Your chairman and my very good friend, General Young, has suggested to me that you would like to hear something about the St. Lawrence Power Project and Seaway. I have made arrangements so that at the end of my talk you will see the *première* of an Ontario Hydro film which is not yet released. The film is entitled "From Dream to Reality", and deals with the development of the St. Lawrence Power Project, one of Canada's more important engineering achievements.

I should make it clear from the beginning that as chairman of Ontario Hydro I have been directly connected only with the power development of the St. Lawrence River. From a technical standpoint, the power and navigational projects are integrated; with the engineering

*The flooding of the headpond, or power pool, necessitated the relocation of seven communities and part of an eighth along a 40-mile stretch of the north shore of the St. Lawrence. Shown in this aerial photograph is the new village of Iroquois. The community's former site is indicated by the cleared portion (left). Iroquois dam is in the background.*





General Arrangement Map of the International Rapids Section of the St. Lawrence, showing the extent of flooding, the location

features of each dependent upon the other. However, they have been financed, built and will be operated by two distinct entities, the power project being the more costly of the two.

The power development centres on the International Rapids section of the St. Lawrence. Here the Power Authority of the State of New York and the organization which I have the honour of representing have built adjoining generating stations and associated works at a cost of approximately \$600,000,000. The power development has a maximum capacity of 1,880,000 kilowatts of electricity. Even in these days of massive accomplishments, these are impressive figures.

It was agreed from the outset that the electric power from this mighty river and the cost of the entire project would be shared between us. The date of completion is the autumn of 1959. By that time thirty-two generators will be in operation, sixteen on our side of the power plant and sixteen on the American side.

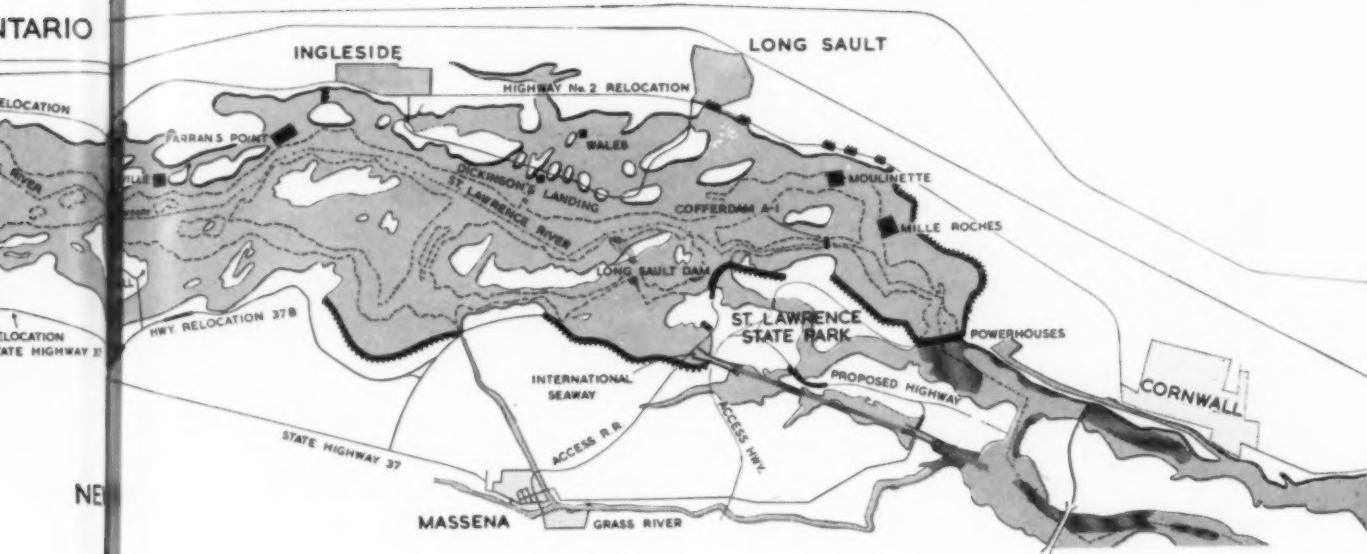
On September 5th of last year the first generating units on both sides of the borderline were ready and set in operation. I recall

telling the 2,000 guests who assembled on the power dam to watch the opening ceremonies that so great had been the interest in this project that during the previous eighteen months alone 1,800,000 people had travelled to the Canadian side of the St. Lawrence Valley to view our progress.

The interest of these hundreds of thousands of visitors, ladies and gentlemen, was not only in the magnitude of the project itself; it was awakened and stimulated by the exhilarating, encouraging and fascinating aspects of this undertaking. That in this troubled world of restless and often exaggerated nationalism, two great and friendly peoples should combine their skills and their resources to share the waters of a frontier river so that the prosperity and the living standards of both should benefit, is not only something which appealed to the hearts of the people of Canada and the United States — it touched the imagination of other less fortunate nations and set a unique example of enlightened mutual interest and peaceful co-operation.

On the power dam, at the dividing line between the United States and Canada, we will

## HIGHWAY TO THE INLAND SEAS



ds Section  
the location

of the principal power and seaway structures, as well as the communities, highway and railway relocations.

place a block of black granite upon which these words will be carved: "This stone bears witness to the common purpose of two nations whose frontiers are the frontiers of friendship, whose ways are the ways of freedom and whose works are the works of peace."

This monument will serve to remind those who visit the St. Lawrence power development in the years to come of the spirit of friendly co-operation, of understanding and of goodwill, which presided over its planning and made possible its construction.

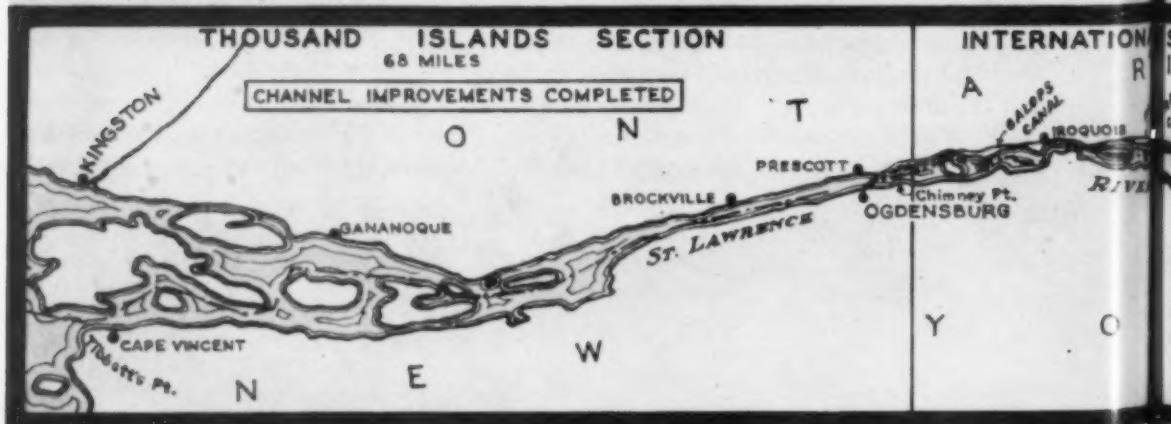
I will now deal with the central subject of my address, the St. Lawrence Seaway. The Seaway will provide a deep-water channel of 27-foot draft, almost halfway across the continent, opening the heart of North America to a major portion of the world's salt-water shipping.

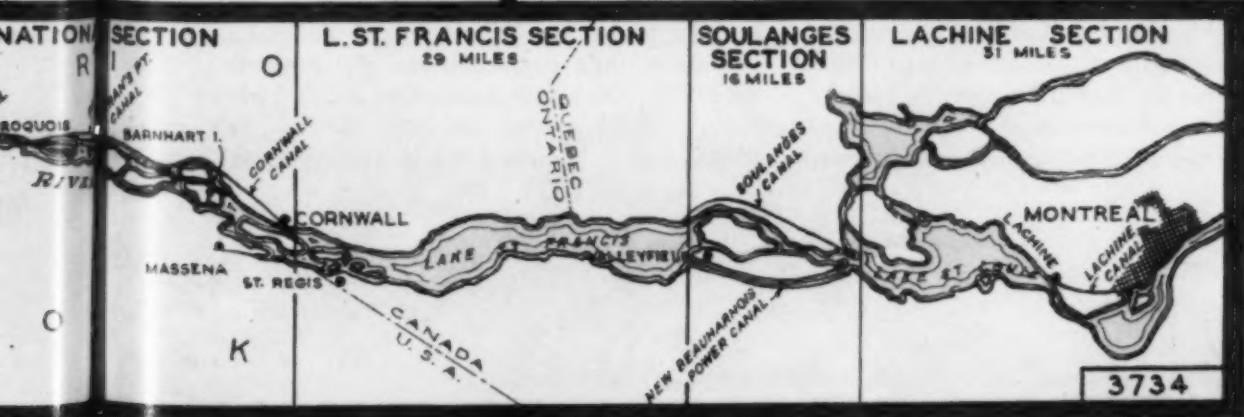
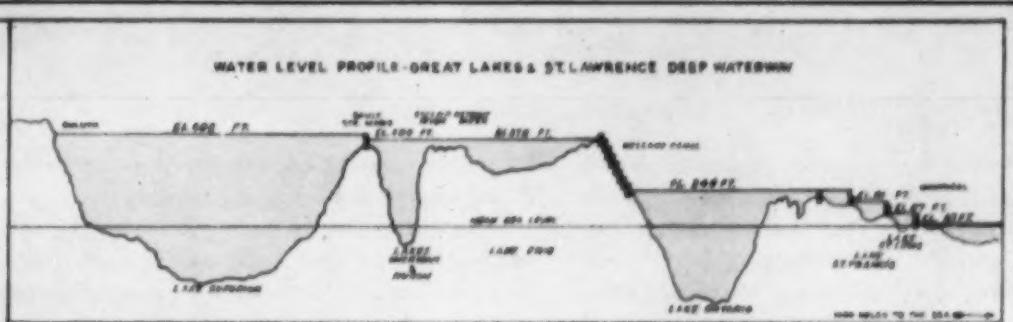
It is easy to understand why this colourful project, with all its international connotations, should have captured the imagination of the peoples of the world. The fact remains, however, that the most important engineering work, and the most costly, was not the deepening of the Seaway channels, or the installation of the new locks, but the power project. The latter

will cost, as I have said, approximately \$600,000,000; whereas the former is estimated to cost some \$451,000,000. Since we are talking of figures, it is also a little known fact that of this figure of \$451,000,000 Canada's share is \$329,000,000 against the United States' share of \$122,000,000.

The old canal system in the International Rapids section ceased to operate when we raised the water levels at the power project on July 1st of last year. The remainder of the 14-foot system continued in use until the close of navigation last year. When this system was in operation it was necessary for steamship operators in the Great Lakes to operate two fleets: one which remained in the lakes and sailed between Fort William or Port Arthur and Lake Ontario, and another, composed of ships drawing only fourteen feet of water, much smaller and narrower in beam, which could travel between Lake Ontario and the St. Lawrence ports.

In addition to this, upwards of eighty per cent of the world's ocean freight traffic, which previously could not navigate beyond the port





of Montreal, will now have access to the Great Lakes.

It is obvious that the elimination of transhipment and the direct access of larger ships with greater cargoes will result in lower shipping costs and therefore will accelerate international trade. These costs will be reduced in at least four ways. First, the operating cost per ton of capacity, because of the larger size of the vessels, will be lower. Secondly, the expenses involved in trans-shipment of cargo to smaller vessels or rail transportation will be largely eliminated. Thirdly, the risk of damage, weight loss and deterioration, always present in the transfer of cargo, will be removed. Fourthly, there will be a substantial saving of time.

It is perhaps a little early to estimate what the saving in cost will actually be, but I am informed on reasonable authority that the decrease in cost of shipping grain from the Lakehead to Montreal and other ocean ports will range from three to seven cents per bushel. The cheaper water transport which will ensue will accelerate the already rapid expansion of the industrial empire surrounding the St. Lawrence-Great Lakes Basin, and at the same time will assist in the gradual development of this area into a major centre of international trade.

The Seaway is but a small part of what is called the St. Lawrence and Great Lakes Basin, a vast drainage system covering an area of 680,000 square miles (nearly eight times the total area of Great Britain) and including the five Great Lakes, which contain nearly half the fresh water of the world.

The area bordering this system contains what has been described as the greatest concentration of industry in the world. More than sixty per cent of all Canadians live in the provinces of Ontario and Quebec adjoining the water-way. These provinces account for nearly eighty per cent of Canada's manufacturing and processing industries. They also share a large portion of Canada's abundant natural resources.

On the other side of the dividing line, the eight States adjacent to the Seaway possess thirty-five per cent of the population of the United States. Almost one-half of the total American exports of non-agricultural products

to overseas destinations originate in the Great Lakes Basin.

Physically, this inland water-way consists of five navigational steps as the river drops from the head of the lakes to the ocean. A fall of twenty-one feet between Lake Superior and Lake Huron is traversed by the locks at Sault Ste. Marie. The second step is found in the St. Clair River-Detroit area, with a drop of eight feet into Lake Erie.

In the Niagara River, between Lake Erie and Lake Ontario, Nature formed Niagara Falls, majestic as a cataract but also a formidable obstacle to navigation. Along with the rapids, this provides a drop of 326 feet, which is by-passed by means of the Welland Ship Canal, built by Canada across the Niagara Peninsula.

The fourth step is a fall of 225 feet in the upper St. Lawrence River between Lake Ontario and Montreal. This section includes the International Rapids, the site of some of the major works of the Seaway and of the power development, to which I have already referred. Finally, between Montreal and the sea there is another drop of twenty feet.

So much has been said and written of the present St. Lawrence Seaway that many of us forget the fact that Canada built a nine-foot seaway connecting the Great Lakes to the ocean, which was completed in 1850. The deepening of the locks, canals and channels of this system, after Confederation, was finished in 1904 and permitted vessels of 12½-foot draft and under to use its facilities.

The purpose of the latest Seaway project is to deepen the section between Montreal and Lake Ontario, a distance of approximately 183 miles, and the Welland Canal across the Niagara Peninsula, to a maximum of twenty-seven feet.

When Canada completed the Welland Canal in 1932 it was built to accommodate ships of 23½-foot draft. This was for a dual purpose. Primarily, of course, it allowed communication between the Great Lakes and Lake Ontario by large ships measuring 700 feet in length, which carry huge cargoes of coal and iron ore, petroleum, cement, grain, and so on, to ports between the Lakehead and Lake Ontario. At the same time Canada foresaw that some day

## HIGHWAY TO THE INLAND SEAS

the channels on the St. Lawrence would be deepened, enabling larger freighters to travel from the oceans of the world to the Great Lakes into the heart of the North American continent.

The deepening of the Welland Canal to twenty-seven feet, which was undertaken as a part of the new St. Lawrence Seaway, was greatly facilitated as a result of the work which was undertaken in 1932.

The new locks have a usable length of 768 feet and are 80 feet wide. They will enable lake freighters of up to 25,000 tons to travel between the Great Lakes and the ports along the lower St. Lawrence. Thus the new Seaway will accommodate vessels having a capacity nine to ten times larger than those which used the old St. Lawrence canals.

The twenty-one locks of the old Canadian seaway system have been replaced by seven, five of which are on the Canadian side and two on the American — the Eisenhower and the Snell.

It is interesting to note in this connection that provision has been made by Canada so that, if necessary in the future, two additional locks could be built on the Canadian side at relatively small expense. These additional locks would permit traffic to pass through the entire St. Lawrence Seaway, using Canadian structural facilities only.

Ports, such as Toronto for example, are spending millions of dollars to improve their facilities to meet the requirements of greater traffic and larger vessels. It is estimated that approximately \$100,000,000 is being spent by the United States and Canada in the improvement of their port facilities along the Seaway system.

In accordance with legislation enacted in both the United States and Canada when construction was approved, the capital cost of this navigational project will be liquidated over a fifty-year period by means of a system of tolls on ships making use of the water-way. Proposals have been submitted but not yet authorized by the responsible authorities.

It is imperative that these rates should not be set too high lest the objectives of this imaginative project — namely, to provide a

cheaper form of transportation to and from the Great Lakes area — be defeated. I am confident that in due course an equitable schedule of tolls will be decided upon.

By far the largest tonnage of traffic on the St. Lawrence Seaway will move, of course, between American and Canadian ports, but I have seen one estimate which suggests that within a decade the volume of direct overseas shipments will be five times larger than it is at present.

It has been estimated that for the first year of operation between Montreal and the Great Lakes the freight will amount to 25,000,000 tons. It is predicted that this will increase to 50,000,000 tons by 1968.

We must not expect miracles. The build-up of traffic will be gradual. Problems of pilotage, of traffic congestion and transfer of overseas cargoes to other ports during the winter season, when the Seaway is closed to shipping, will be encountered.

The advantages of this enlarged water-way connecting the oceans of the world with one of the richest industrial, agricultural and mineral areas of the continent are, however, self-evident. An indication of the growing interest of shipping firms in the St. Lawrence Seaway can best be illustrated by the statement that some years ago only seven or eight lines competed for overseas business out of the port of Toronto. Last year the port of Toronto had twenty-seven lines competing for business, with 150 ships serving European ports and South America. They are obviously preparing themselves to be ready competitively against the day, so rapidly approaching, when the 27-foot depth will give access to upwards of eighty per cent of the freighters which travel the high seas.

Transportation has always been vital to Canadian progress. A small scattered population, taming a vaster space than ever in human history was brought to man's use by so few people, natural resources remote from the centres of habitation, a dependence upon far away export markets — all these things have made an efficient system of transportation essential for the continued growth of our economy.

Today a new air of confidence is abroad in the land. Governments, Chambers of Commerce and individual business men feel that Canada is mustering once again the ingredients of another round of economic expansion, after marking time for eighteen months or so.

With the exception of a few weak spots, the internal business picture is becoming increasingly encouraging. A number of major capital projects are planned, and new opportunities of trade with the rest of the world lie before us. Iron ore in Quebec and Labrador, uranium in Ontario, nickel in Northern Manitoba, oil and natural gas on the Prairies, water-power to produce aluminum in British Columbia and Quebec, and, of course, the St. Lawrence Seaway and Power Project are already part of the panorama of progress.

But Canada is nowhere near the end of her great economic projects. The mammoth South Saskatchewan River irrigation and power project is now in its early stages. The harnessing of the untamed forces of the Hamilton River in Labrador, with a potential of over 4,000,000 horse-power is under consideration, as well as a gigantic hydro-electric project in the Peace River country of British Columbia.

A population of between 40 and 50 million will be ours by the turn of the century. This material growth in the next forty years should be swifter than that of any other country, except perhaps Russia and China.

I would, however, be less than sincere if I did not say to you that the optimism which I have expressed is predicated upon the hope that we as a people, dependent as we are to a degree far greater than most other nations on our ability to export our products — or, to put it differently, on our ability to compete price-wise and quality-wise in the markets of the world — will take steps to curtail radically our soaring costs.

If this wage-cost inflation is not brought under control our more optimistic hopes of rapid expansion may well evaporate and we will not have taken full advantage of the greater opportunities with which a bountiful Providence has provided us.

We are a great trading nation. We cannot live and cannot prosper without exports, and

we cannot continue to export our products in the necessary quantities if they cannot be sold competitively in the world's markets.

We are a high wage-cost nation. There is nothing the matter with this, provided that our productivity is kept on a correspondingly high level; but when I see what is going on around me, I begin to wonder sometimes whether our incessant demands for ever higher wages are not outpacing our higher productivity.

But it is not only wage levels which are to blame. Each one of us must carry his share of responsibility. Individually and collectively we are all asking for more — more wages, more profits, more social security, more public buildings, more highways, more luxuries. Are we proposing to work harder to get all these desirable things? On the contrary, we are clamouring for shorter hours, longer holidays.

My friends, this is not the way to build a great nation. Canada with her unbounded future, with her limitless prospects, is too young a nation to be able to rest on her oars and take things easy.

The future which lies ahead of Canada and her people is perhaps brighter than that of any other country in the world today, if we are prepared to work for it and to prove ourselves worthy of our great opportunities.

Now, one last word before I leave this gathering. I can see in your faces that you do not basically disagree with my point of view. There are, however, many among us in this gathering tonight who will perhaps leave this hall saying to themselves: "I believe this man was right and the government should do something about it." My friends, it is not to the government that we should turn, but to ourselves. Human nature being what it is, democratic governments in times of peace do not usually initiate action which calls for sacrifice unless they have reason to believe that the people as a whole have enough common sense, enough vision, and enough courage to back them up. Curbing the process of cost inflation may take some of the icing off the gingerbread of our present-day lives but it will ensure for ourselves and our children a future in which they and their country will continue to prosper.



## Some Flowers of Canada

Notes by H. J. SCOGGAN

National Museum of Canada photographs

### Canada Anemone (*Anemone canadensis*)

**T**HE NAME of the anemone is derived from the Greek word *anemos*, meaning wind. The relatively slender stems of most species bear large leaves and are easily swayed by the breezes. It is a member of the Crowfoot (Buttercup) Family. The anemone is found in damp thickets and meadows and on gravelly shores from the south-western Mackenzie district to northern Manitoba, eastern Quebec and New Brunswick, and southward through most of the United States. It flowers from May to July, producing five large white unequal petal-like sepals, but no petals. The stamens are numerous. The leaves are divided into five to seven parts, each division usually being cleft three times.



River Beauty or Broad-leaved Willow-herb (*Epilobium latifolium*)

**T**HE NAME *Epilobium* is derived from the Greek *epi*, meaning upon, and *lobon*, meaning a capsule, referring to the way in which the perianth (floral envelope) rises from the top of the ovary. It is a member of the Evening-primrose Family and is found in river gravels, on the margins of streams and on damp slopes from Alaska to northernmost Ellesmere Island, Labrador and Newfoundland and south in Canada to Vancouver Island, Great Slave Lake, James Bay and the Gaspé Peninsula. The flowers appear from June to early September — four large purple or roseate petals with eight stamens and four green sepals. The leaves, springing from the depressed crowded upwardly arching stems, are strongly whitened, veinless and rather thick and fleshy. Despite its delicate appearance, this is a very hardy plant. The petals have been observed by the Arctic specialist, A. E. Porsild, "frozen as stiff as wax flowers and covered with tiny ice crystals." He added that when the sun rose over the mountain range a few hours later, "The flowers thawed and showed not the slightest sign of frost damage."



**Prickly Pear Cactus (*Opuntia polyacantha*)**

**T**HIS MEMBER of the Cactus Family is found in dry prairie and sandhills from southern British Columbia to southern Manitoba and as far south of the Canadian border as Utah, New Mexico and Missouri. In June and July it produces its showy flowers with numerous sepals, yellow petals and stamens. The stem is jointed and the flat very fleshy segments bear numerous spines in the axils of the scale-like deciduous leaves.



**Painted Trillium (*Trillium undulatum*)**

**T**HE NAME, Trillium, is derived from *tres*, meaning three, since all the parts of the flower are in threes — three sepals, three petals, six stamens, stigma three-lobed, and fruit three-chambered. This woodland spring flower is a member of the Lily Family which blossoms from April to June. It is native in rich woods from Ontario to Nova Scotia. With the exception of its flower, it resembles the White Trillium. The flower of the Painted Trillium, however, has three large white petals, each with a red to purplish blotch at the base.



Fragrant Water-lily (*Nymphaea odorata*)

**T**HE NAME *Nymphaea* refers to the classical one for the water-nymphs. This member of the Water-lily Family is native in ponds and deadwaters from central Manitoba to Newfoundland and south to Louisiana and Florida. When it flowers between June and September, it has four green or purplish sepals and numerous eye-catching white petals. Those of the inner rings show a gradual transition into stamens, and there are thirty-six to 100 stamens. The flowers, which float on the surface of the water, are very fragrant. Around them float the roundish leaves, marked with a narrow V-shaped cleft between their two lobes.



*Directors and guests at the thirtieth Annual General Meeting of The Royal Canadian Geographical Society, 12 March 1959. Seated (l. to r.): Mr. James S. Duncan (Chairman of The Hydro-Electric Power Commission of Ontario; guest speaker), Major-General H. A. Young (President), Superintendent H. A. Larsen (nominee for Massey Medal award, 1959). Back row (l. to r.): Mr. G. M. Dallyn, General A. G. L. McNaughton, Dr. Marc Boyer, Mr. R. G. Robertson, Dr. C. J. Mackenzie, Colonel A. F. Duguid, Major-General G. R. Turner, Mr. E. S. Martindale, Dr. B. R. MacKay, Vice-Admiral H. T. W. Grant, Dr. C. M. Barbeau, Mr. G. F. Maclarens, Colonel C. P. Stacey, Dr. F. J. Alcock, Mr. F. R. Crawley.*

## **THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY ANNUAL GENERAL MEETING**

The thirtieth Annual General Meeting of The Royal Canadian Geographical Society was held on 12 March 1959 in the Lecture Hall, National Museum of Canada, Ottawa. The President, Major-General H. A. Young, presided over the meeting.

After approval of the minutes of the twenty-ninth Annual General Meeting, the President informed the assembly that he had an announcement to make concerning The Massey Medal of The Royal Canadian Geographical Society:

"You may remember that last year I was authorized by His Excellency the Governor General to make a special announcement that a new award had been established, The Massey Medal of The Royal Canadian Geographical Society. This is to be a gold medal presented by the

Massey Foundation and awarded annually by our Society for outstanding personal achievement in the exploration, development or description of the geography of Canada.

"A committee under the chairmanship of Dr. C. J. Mackenzie was appointed to consider the qualifications of eligible candidates and select a nominee for the award. Their recommendation, duly submitted to the Board of Directors, was unanimously approved. The Society is proud to name Superintendent H. A. Larsen of the Royal Canadian Mounted Police as their first nominee for this distinguished award.

"Henry Asbjorn Larsen was born in Norway and graduated at the Norwegian Polytechnic in navigation. After two early voyages to the western Arctic as mate and navigator,

he joined the Royal Canadian Mounted Police in 1928 and was posted for duty aboard the *St. Roch*, of which he became Master in 1935. Between 1930 and 1939 he wintered mostly in Coronation Gulf and Cambridge Bay, and from 1940 to 1942 he made the first west to east voyage through the Northwest Passage, spending two winters *en route*. In 1944 he made the first voyage through the Northwest Passage to be completed in a single year. In 1952 he was appointed Officer Commanding "G" Division of the Royal Canadian Mounted Police, including the Northwest and Yukon Territories, whence he carries out frequent inspection trips to isolated detachments by sea and air. He has published full reports of his voyages and patrols. He is a Fellow of the Arctic Institute of North America;

he was awarded the Patron's gold medal by the Royal Geographical Society, of which he is an honorary member, and he has also been awarded the Polar medal and bar.

"The presentation of The Massey Medal will be made at Government House by His Excellency the Governor General as soon as the design has been completed in accordance with the Society's coat of arms, for which application has been duly made to the College of Arms. The medal will then be struck at the Royal Canadian Mint and presented to Superintendent H. A. Larsen."

After making this announcement and introducing Superintendent Larsen to the assembly, the President reported on the activities of the Society during 1958:

"Honoured guests, members of The Royal Canadian Geographical Society and friends:

"Upon this occasion we are celebrating the thirtieth year of our foundation. On the 13th of February 1929 a devoted band of scientific men with far-sighted vision met to consider the advisability of organizing a Canadian Geographical Society, and it is to the energy and foresight of Dr. Charles Camsell and his colleagues that our Society owes its inception and its charter, dated 30 May 1929. It is indeed a matter of deepest regret to all of us that Dr. Camsell did not live to attend this thirtieth anniversary meeting. His death occurred on the 19th of December 1958, and we paid tribute to his honoured memory in the January 1959 issue of the *Canadian Geographical Journal*. Another sad loss we have to record is that of our staunch friend and director, representing Newfoundland, Sir Albert Walsh, to whose memory we paid tribute in our February issue.

"In spite of the unceasing rise in production costs, we feel we can look back on a year of publication with reasonable satisfaction. Suggestions are made from time to time that the contents of the Journal might be more of a popular nature, which might make it easier to increase our membership. We on the Board, and I am sure you will all agree, consider that it is desirable to maintain a high standard and this we intend to continue.

"In my report of a year ago I indicated the Society's continuing interest in Canada's Northland. In the past thirty years we have published one hundred and twenty-five articles on this region. In September 1958 we devoted the first entire issue to the great Canadian North: it contained nine articles each written by an expert in his own field of arctic or sub-arctic work. Ten thousand extra copies of this issue were purchased by the Department of Northern Affairs for placement in the secondary schools of all ten provinces, the Yukon and the Northwest Territories — a service greatly appreciated by Departments of Education.

"During the year seventeen articles of Canadian import, first published in the Society's Journal, were reprinted in booklet form. This brings the total to over six and three-quarter million booklets, dealing with the varied history, resources and development of Canada, which have been purchased and distributed by departments of government and industry. They find their way into schools across Canada as teaching aids, and many to libraries in all parts of the world. They form an important supplement to the Society's official monthly publication, the *Canadian Geographical Journal*, with which you are all familiar, in the wide dissemination of authentic information about Canada which is the basic object of the Society.

"In addition, the Society's provincial series of ten 32-page illustrated booklets is in continuing demand, and the 224-page book *Image of Canada*, edited by the Society with illustrations from the Journal and published by The Ryerson Press, went into its fifth impression this past year and the demand is well sustained.

"It may interest you to know that in the past twenty-three years — or since the Society embarked on publishing booklets — some two and a quarter million dollars, representing membership fees, and advertising and publication revenues, have been invested in Society services. But maintenance of standards demands much more than dollars paid out, and I must again pay tribute to our expert consultants throughout the length

and breadth of Canada who freely contribute their services and in so doing assist immeasurably in keeping the Journal in the forefront as one of Canada's leading reference publications.

"The financial position of our Society is not as satisfactory as we would like it to be. However, the donations which we have received through our extension fund during the past few years have been most helpful. To date they total thirty-five thousand dollars. Our working capital is better than it was a year ago, due largely to contributions of fifty-nine hundred dollars received during 1958 on our extension fund account from industry and individuals who felt that the work of the Society was of sufficient importance that it must not lack the necessary working capital. To these very good friends I express on your behalf our most sincere thanks.

"I would like to say a word about membership. At the end of 1958 our membership roll was 10,090, a slight improvement over that reported a year ago. How we are to extend this membership is a question of deep concern to your directors. The need is twofold: placement of the Journal to reach a larger segment of our population, and more money from fees to reduce publication costs. Extensive tests have proved that increasing our membership by correspondence is too costly a method to pursue on any large scale with our present financial resources. We have come to the conclusion that the only way open to us is the personal approach by our members. May I therefore request the active interest of every member in securing at least one new member this year.

"We have found that many members have circulated their Journals to interested friends, church groups, schools, and that often these same copies eventually reach a community in Scotland or elsewhere and become the reading piece of the village. This is all most useful in carrying out the object of the Society in disseminating information about Canada — but it does not increase our membership or provide needed extra revenues.

(Continued on page IX)

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"Concerning the activities of the Society which we would like to see made more active, the provision of scholarships is one which I would like to emphasize. There are, however, other projects which we feel the Society should be undertaking, but to implement them requires greater financial support than we have at the present time. Faced with an increase in publication costs of upwards of ten thousand dollars in 1958, we were forced to reduce the number of pages in the Journal. In spite of this, our losses in operations for the year were some thirty-two hundred dollars.

"Our vision of usefulness must be contained within the financial limits of our resources. For that reason we make an appeal to all members to give us their most active support. We have at present well over ten thousand members. If every member was to obtain an additional member the total of twenty thousand would make a material difference to our financial position. Let us hope we have your support in that regard in 1959."

The report of the Honorary Treasurer was presented by Major-General G. R. Turner. General A. G. L. McNaughton then submitted the report of the Nominating Committee; ten directors were re-elected.

The President announced that there would be a meeting of the Board of Directors in the Lecture Hall following the Annual Meeting. He then introduced the speaker, Mr. James S. Duncan, C.M.G., LL.D., Chairman of The Hydro-Electric Power Commission of Ontario.

Mr. Duncan spoke on various aspects of the St. Lawrence Seaway development under the title "Highway to the Inland Seas". His address was followed by a *première* showing of the Ontario Hydro film "From Dream to Reality". The text of the address is given on page 152.

General A. G. L. McNaughton thanked the speaker for his stimulating and informative address. Dr. B. R. MacKay expressed the thanks of the Society to the press.

Immediately following the Annual General Meeting the Board of Directors met to elect officers and appoint Standing Committees for 1959.

## EDITOR'S NOTE-BOOK

W. A. Dixon (*Power in New Brunswick*) has been with The New Brunswick Electric Power Commission for some years and is in a position to write with authority on the subject of this article.

\* \* \*

Harry Haigh (*All for a Shilling a Day*), prior to wartime service in the R.A.F., served on the staff of the *Yorkshire Post* in England. He enjoys writing of the English countryside and of old arts and customs.

\* \* \*

James S. Duncan (*Highway to the Inland Seas*) was guest speaker at the Society's thirtieth Annual General Meeting held in March this year. He addressed members and their guests on the St. Lawrence Seaway and Power Project. Mr. Duncan has been Chairman of The Hydro-Electric Power Commission of Ontario since his appointment in November 1956. Prior to that he was Chairman and President of Massey-Harris-Ferguson Limited.

\* \* \*

H. J. Scoggan (*Some Flowers of Canada*) is a botanist with the National Museum of Canada, Ottawa, and is a recognized authority on the flora of Canada. He holds a Ph.D. degree from McGill University.

## AMONGST THE NEW BOOKS

### Geophysics and the IGY

Edited by Hugh Odishaw and Stanley Ruttenberg

(American Geophysical Union, Washington, D.C. \$8.00).

If there is anyone still to be convinced of the tremendous scope of the programmes of the International Geophysical Year let him take up this book! For this volume is a group of papers covering a wide variety of topics in geophysics which were presented at a special symposium just before the I.G.Y. formally began. It is primarily concerned with the geophysical research which formed the basis for the I.G.Y. programme of the United States of America but many of the chapters present reviews of the general status of a discipline and a summary of its development from earliest times. The paper on "Background and Technical Objectives in Geomagnetism", for example, begins with a quotation of an oriental scholar of the eleventh century.

The papers are divided into three groups. The largest, consisting of eighteen contributions, deals with "Upper Atmosphere Physics". This is followed by ten papers on "The Lower Atmosphere and the Earth", and the final two papers deal with the Polar regions. Thus the studies range from those in fields whose names are more or less familiar, such as oceanography, mountain glaciology and seismology, to such special and new fields as "whistlers". These are "audio-frequency radio waves arising from lightning flashes", unheard of before 1919. Several of the observing points for this phenomenon were in Canada — in the Northwest Territories, and Quebec and at Saskatoon, Ottawa and Halifax.

Of special interest are the five chapters concerned with rockets and satellites. "The Rocket as a Research Vehicle" describes three types of research rockets and the measure-

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ments to be made with them. This is a prelude to "The Pre-I.G.Y. Rocket Program of the United States" with the plan to launch rockets from "a major new location in the auroral zone at Fort Churchill, Canada". The proposed work with satellites is presented in three parts — "The Launching Vehicle", "The Tracking Program" and "Scientific Instrumentation of Satellites".

The book is well illustrated and documented although, unfortunately, it has no index. It is, of course, a work for the earth scientist. Despite this, and the fact that much of the technical detail will have no appeal for the general reader, there is much absorbing material here for those interested in the exploration of space.

N. L. NICHOLSON

*Dr. Nicholson is Director of the Geographical Branch, Department of Mines and Technical Surveys, Ottawa.*

\* \* \*

## The Pattern of Asia

by Norton Ginsburg et al

(Prentice Hall, New Jersey. \$11.65)

This is in effect a text book on the political and economic geography of Asia, the joint product of the editor

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and five others, John E. Brush, Shannon McCune, Allen K. Philbrick, John R. Randall, and Harold J. Wiens. It consists of thirty-nine chapters grouped into six sections. The first section is a general introduction to Asia; the remaining five sections deal in turn with East Asia, Southeast Asia, South Asia, Southwest Asia, and the Soviet Union. The editor claims that the book has a theme which makes it distinctive — the changing political and economic geography of Asia and the illumination of the various problems and potentials of the countries of Asia. The script of the book is illustrated with thirty-six maps or charts which, though on the small side for the detail they comprise, are of great interest, numerous well-chosen photographs, some statistical tables, and a bibliography (mostly put at the end of the chapters). The bibliography concentrates on publications in the English language, which might be reckoned as some limitation on the part of authors of a volume of this scope and quality. Subject to this limitation the bibliography seems to be good though a minor exception is to cite a periodical propaganda publication from the Indonesian Embassy in Washington which is scarcely in place in a scientific work.

This is a book which can be appraised properly only by a geographer. I am not a geographer and can pronounce upon it only as an amateur and more particularly upon those sections dealing with areas with which I have some continuous personal acquaintance, namely Indonesia, Japan, India, Pakistan, and the Middle East. I have found these chapters to be factual, objective, well informed, and well balanced. There are some trifling misstatements such as about the antiquity of the Rajputs in India (pages 579-80); the management of Garuda, the Indonesian airline, by KLM (this ceased four or five years ago); claims to East Irian (page 365); but they are trifles and there seem to be very few of them in a book which makes some thousands of statements of fact.

The part on Israel is a good example of the authors' brief but masterly treatment. The two sections on Russia and Asia and on Soviet Asia set out information which will be new to most people. This in short is a book by scholars and written with the integrity of authentic scholarship. A useful addition to any geographical reference Library.

W. R. CROCKER

Mr. W. R. Crocker is High Commissioner for Australia to Canada, and has lived and worked in many countries of the world.



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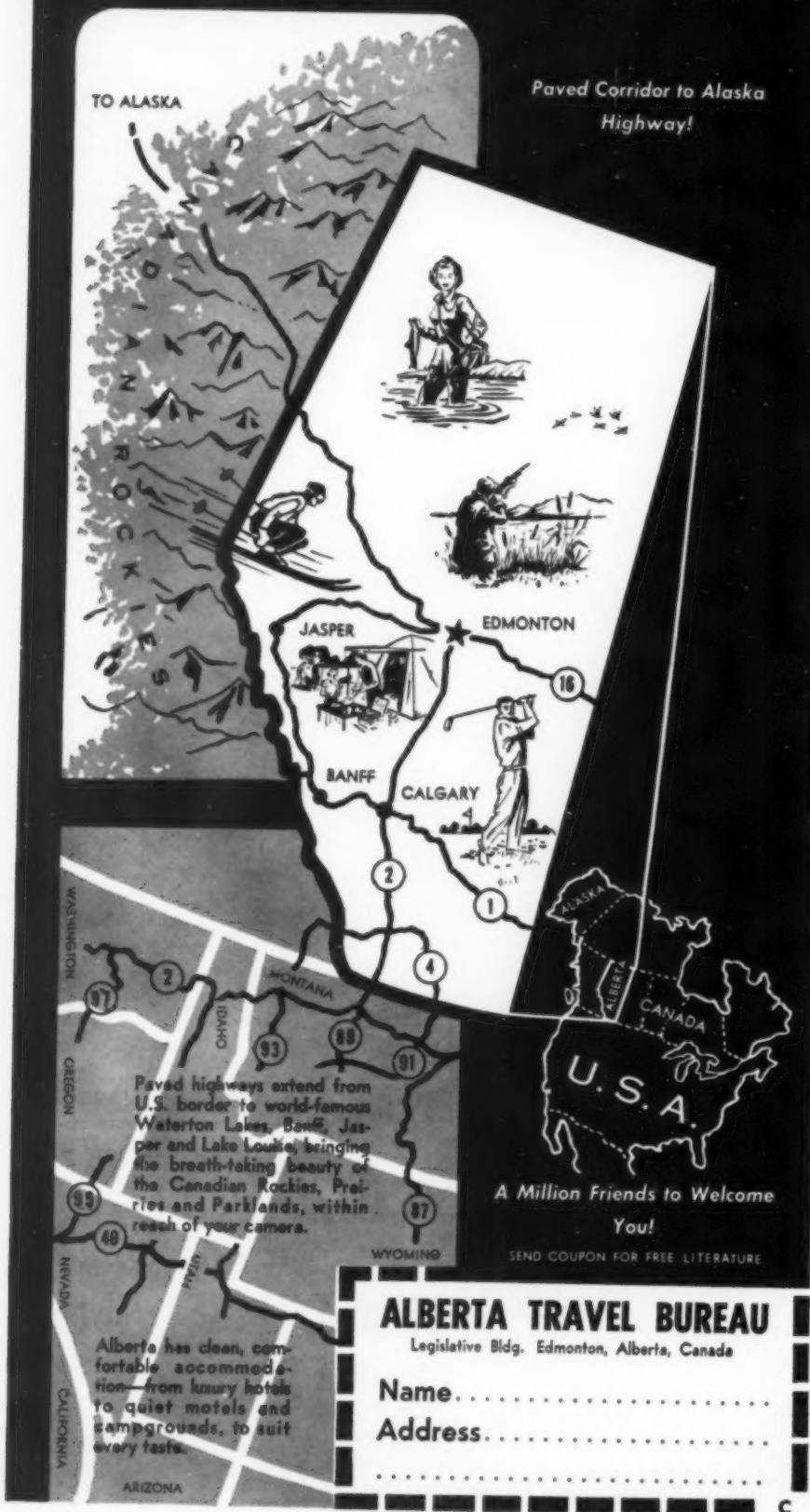


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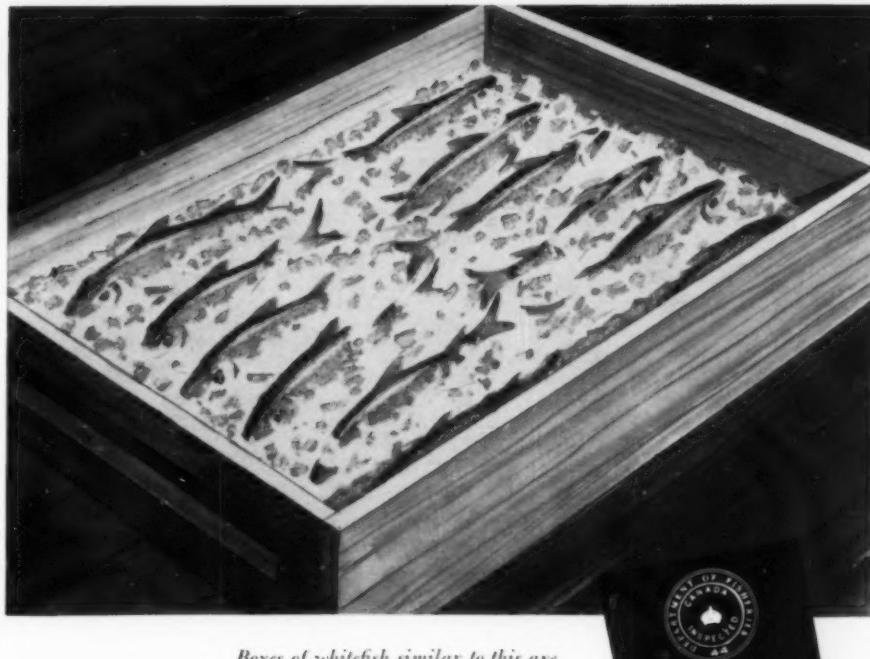
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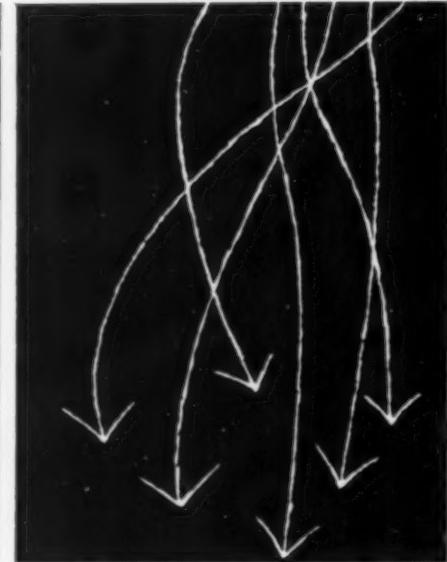
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